TABLE 37. (Continued)

State	Base Case	Polluter Pays Options: 8 Million Ton Rollback Option II-1A	Polluter Pays Options: 10 Million Ton Rollback Option II-2A	Sulfur Tax Options: Option V-1	Sulfur Tax Options: Option V-2
Michigan	57.7	58.4	58.2	58.9	58.7
Minnesota	54.2	54.4	55.1	54.7	55.6
Missouri	59.6	62.3	63.8	65.0	67.2
Montana	41.1	41.0	41.0	40.7	40.9
Nevada	48.8	47.1	47.0	46.2	45.2
New Mexico	68.2	66.9	67.2	63.6	60.2
New York (Downstate), New Jersey	99.3	100.0	100.3	99.5	99.3
New York (Upstate)	53.1	53.7	55.3	54.3	54.0
Ohio	57.8	59.8	62.2	61.6	60.5
Pennsylvania	58.2	59.3	60.0	60.9	60.3
Tennessee	46.9	47.3	50.7	49.0	48.6
Texas	79.4	79.4	79.4	78.6	80.5
Utah	39.0	44.7	44.7	38.7	38.0
Virginia, District of Columbia	58.7	60.0	60.7	60.3	59.9
Washington, Oregon	35.4	35.3	35.4	35.2	35.3
West Virginia	27.2	26.8	46.7	19.2	18.5
Wisconsin	52.7	55.1	57.9	57.0	56.2
Wyoming	43.0	43.3	43.5	40.9	42.0
U.S. Average	62.0	62.8	63.5	63.0	63.0

SOURCE: Congressional Budget Office.

TABLE 38. TAX REVENUES AND AVERAGE TAX RATES UNDER TWO SULFUR TAX OPTIONS, BY STATE (Revenues in millions of 1985 dollars; rates in 1985 dollars per ton of coal)

	Option V-1				Option V-2			
State	1986 Revenues	1986 Tax Rate	1995 Revenues	1995 Tax Rate	1986 Revenues	1986 Tax Rate	1995 Revenues	1995 Tax Rate
Alabama	252	12.50	232	9.12	210	10.39	221	7.91
Arizona	21	1.51	21	1.51	28	2.00	28	2.00
Colorado	31	1.65	31	1.53	36	1.89	51	2.40
Illinois	1,451	24.12	1,198	25.26	1,373	22.82	1,146	23.65
Indiana	562	21.97	527	21.69	531	20.77	510	20.82
Iowa	3	29.60	13	28.08	3	30.60	14	29.06
Kansas	39	31.95	13	32.10	36	29.31	98	26.13
Kentucky	2,083	12.71	1,361	6.93	1,776	10.84	1,434	6.82
Maryland	17	15.52	20	13.43	14	12.88	29	13.50
Missouri	156	28.65	155	28.72	160	29.35	230	29.35
Montana	89	3.06	140	4.14	135	4.63	162	5.24
New Mexico	46	1.98	60	1.89	79	3.40	102	3.27
North Dakota	69	4.21	16	0.71	164	10.00	96	4.23
Ohio	704	29.77	52	27.46	628	26.57	128	22.82
Oklahoma	59	20.49	89	11.88	49	17.27	98	11.72
Pennsylvania	1,274	17.97	1,204	17.48	1,052	14.82	1,031	14.81
Tennessee	58	12.42	71	10.24	48	10.22	58	8.44
Texas	182	4.16	572	5.17	453	10.37	990	10.74
Utah	56	3.74	110	3.37	52	3.47	173	5.21
Virginia	250	5.78	240	4.44	191	4.41	204	3.66
Washington	27	7.39	4	8.53	41	11.30	0	0.00
West Virginia	1,583	12.19	1,745	6.41	1,256	9.67	1,423	5.44
Wyoming	64	0.56	75	0.47	194	1.70	161	1.13
U.S. Total Revenues and Average Tax Rate	9,076	10.93	7,951	7.00	8,507	10.24	8,386	7.48

SOURCE: Congressional Budget Office.

revenues under each policy.[8] If the tax stipulated in Option V-1 was levied on the amount of coal used in 1985 (assuming that in the short run,

8. These figures are derived from the 1985 solution of the National Coal Model and not actual shipments. This may underestimate tax revenues slightly, as the solution yielded slightly less production in 1985 than actually occurred. In addition, export coal tax revenues are included, although they would likely be exempted.

current contracts would continue), the average nationwide tax rate would be $10.93 per ton, providing $9.1 billion in first-year revenues. Most of this revenue ($7.1 billion, or 78 percent) would come from coal shipped from Illinois, Kentucky, Ohio, Pennsylvania, and West Virginia. The average tax rate in this region would be $22.28 per ton, but could range as high as $29.77 in Ohio. In contrast, coal from Wyoming would be subject to an average tax of only $0.56 per ton; for most Wyoming coal, no taxes would be charged because its sulfur content lies below the threshhold level of 10 pounds per ton.

The initial revenues expected under Option V-2 would be somewhat lower, at $8.5 billion per year. Revenues from coal shipped from the five states mentioned above would total $6.1 billion (72 percent of the total), with tax rates in this region averaging $19.11 (compared with the nationwide average of $10.24 per ton). The average rate applied to Wyoming would be $1.70. Since the Option V-2 formula takes into account heat content, the rates applied to high-sulfur coal from the Midwest would be lower than under Option V-1, and the low-energy content coals mined in the West would be taxed at slightly higher rates. Although initial revenues from both proposals would be high, these policies would also grant subsidies ($0.50 for each pound of sulfur removed) for currently operating scrubbers. The CBO estimates that these obligations would require $2.4 billion in 1986, based on current utility scrubber use. Since both policies would grant identical subsidies, the first year fund surplus would be $6.7 billion for Option V-1 and $6.2 billion for Option V-2.

Revenues and Outlays in 1995. Annual revenues under both proposals would decline over time as utilities responded to higher coal prices by switching to lower-sulfur coal. Although the volume of coal shipments would increase by over 25 percent over the next 10 years, the average sulfur content under both options would decline sufficiently to lower the total revenues collected. In 1995 annual revenues from Option V-1 would become $8.0 billion (an average of $7.00 per ton) and revenues collected under Option V-2 would become $8.4 billion (an average of about $7.50 per ton). 9/

Subsidy levels would increase significantly in 1995 from their 1986 levels. The annual payments made to utilities for sulfur removed by scrubbing would rise to $3.3 billion in 1990 under both policies. This 1990 figure assumes that 1985 scrubber use would continue, and adds the subsidies required for planned utility plants for which operation would begin between

9. These figures assume that nonutiltity coal users would not substitute other fuels. Also, the National Coal Model collects some revenues from exported coal (between $400 million and $500 million for each option in 1995), which probably would be exempted under a legislated policy.

1986 and 1990. These annual payments would increase dramatically by 1995, to \$6.2 billion for Option V-1 and to \$6.8 billion for Option V-2 (see Table 39). The incentives inherent in the sulfur removal subsidy would encourage utilities to operate retrofit scrubbers as soon as completed. Therefore, outlays for sulfur removal are assumed to rise steadily between 1991 and 1995, in contrast with the retrofit O&M subsidies examined in Chapter III (Options III-1B and III-2B) which would begin at the 1995 compliance deadline.

The yearly subsidy for retrofit scrubbers (90 percent of annual capital cost) would begin in 1991 and reach about \$620 million in 1995 under Option V-1, and almost \$800 million with Option V-2. This latter figure represents the third highest amount for retrofit capital subsidies of all policies considered in this study, exceeded only by the "top 50" approach (Option III-2C of Chapter III) and the most subsidized emission tax policy (Option IV-3 of Chapter IV). Thus, the total annual outlays in 1995 with Option V-1 would be \$6.8 billion (for a yearly surplus of \$1.2 billion), while outlays under Option V-2 would total \$7.6 billion (an annual \$0.8 billion surplus).

All revenues, outlays, annual capital costs, and yearly operating costs incurred by the sulfur tax policies are assumed to remain constant between 1995 and 2015 in order to estimate the net present value of program costs as well as the trust fund holdings by the government.[10] Annual program costs are discounted at 3.7 percent, which is also the real interest rate applied to government holdings, such as the trust fund arising from the sulfur tax revenues. Under these assumptions, the net government trust fund balance under either option could exceed \$50 billion by 1995, and would continue to grow despite increased subsidy obligations.

Policies that rely on financial incentives to reduce emissions tend to generate large trust fund balances. The options for fund management and possible disbursement outlined in Chapter IV apply to the balances accumulated under Options V-1 and V-2 as well. These include transferring all or some of the surplus to general revenues to lower budget deficits, transferring surpluses to the states based on their net contributions for rate relief and targeted miner employment programs. Trust fund balances also could be limited by phasing in the tax or by delaying the commencement date.

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10. Capital expenditures are tapered off between 2010 and 2015 for purposes of calculating net present value, but the total subsidy figure remains constant to determine trust fund balances. This partially compensates for the fact that new sources would qualify for the sulfur removal subsidy and would, therefore, receive new subsidies as old sources are retired. (Net present value is defined in the box on page 19.)

Coal-Market Effects of Sulfur Tax and Subsidy Policies

Although both Options V-1 and V-2 would elicit a high degree of retrofit scrubber use, the midwestern and some Appalachian coal fields would still experience production and employment losses compared with 1995 base case projections. Compared with production losses predicted under the polluter pays options, however, the two sulfur tax policies would tend to limit midwestern coal losses. This is particularly evident when the projected coal shipments under Option V-2 are compared with shipments expected with a polluter pays, 10 million ton reduction. Table 40 shows predicted 1995 coal production, and Table 41 presents 1995 mining employment under these policies.

In the Midwest and East. Both tax policies would reduce 1995 coal production in Illinois, Indiana, Ohio, and Pennsylvania from the predicted level of 192.2 million tons under current policy to only 142.5 million tons under Option V-1 and 148.2 million tons under Option V-2. Predicted 1995 mining employment in these states also would decline by 14,600 jobs with Option V-1 and by 12,900 jobs under Option V-2. The differences between policies would be particularly acute in Ohio, where Option V-1 would reduce 1995 production to only 1.9 million tons (6 percent of the current level) while production under Option V-2 would be 5.6 million tons, a difference of nearly 1,100 jobs.

In Kentucky, the difference between the two policies would be even more pronounced. With Option V-1, 1995 coal shipments would be 196.3 million tons (very close to Option II-2A), but would reach a level of 210.1 million tons under Option V-2 (nearly the level expected in Option II-1A). This translates into a difference of 4,200 jobs between the two tax alternatives.

In the West and Texas. The Option V-2 formula would assess a higher rate per ton on most western coal, because of its low energy content. The largest western coal producer, Wyoming, would experience a gain in coal production in 1995 of 27.0 million tons over base case projections under Option V-1, but would gain only 12.2 million tons under Option V-2. This would represent an employment difference between policies of less than 700 jobs, because of the low labor requirements for surface mining in the West.

In contrast with most other policies examined in this study, Option V-2 would affect the production of Texas lignite coal, which has moderate sulfur content but very low energy content. 11/ When the Option V-2 tax rate is

11. The two policies examined in Chapter II that restricted fuel switching (Options II-1B and II-2B) also lowered 1995 lignite coal production in Texas by roughly 11 million tons, compared with a decline of more than 17 million tons under Option V-2. Other programs would have negligable effects on Texas coal shipments.

TABLE 39. ANNUAL SUBSIDIES IN 1995 UNDER TWO SULFUR TAX OPTIONS, BY STATE (In millions of 1985 dollars)

	Option V-1			Option V-2		
State	Sulfur Removal Subsidy	Capital Subsidy	Total	Sulfur Removal Subsidy	Capital Subsidy	Total
Alabama, Mississippi	175	0	175	194	18	211
Arizona	50	0	50	47	0	47
Arkansas, Oklahoma, Louisiana	313	0	313	364	0	364
California	49	0	49	49	0	49
Carolinas, North and South	89	0	89	110	0	110
Colorado	44	0	44	59	0	59
Dakotas, North and South	18	2	20	14	0	14
Florida	230	0	230	224	0	224
Georgia	70	0	70	139	4	143
Idaho	0	0	0	0	0	0
Illinois	631	170	801	595	165	760
Indiana	158	4	161	168	3	171
Iowa	23	0	23	25	0	25
Kansas, Nebraska	173	0	173	168	0	168
Kentucky	484	1	485	490	1	490
Maine, Vermont, New Hampshire	18	3	22	20	3	23
Maryland, Delaware	200	60	260	202	60	262
Massachusetts, Connecticut, Rhode Island	75	14	89	75	14	89

(Continued)

TABLE 39. (Continued)

State	Option V-1			Option V-2		
	Sulfur Removal Subsidy	Capital Subsidy	Total	Sulfur Removal Subsidy	Capital Subsidy	Total
Michigan	64	1	64	96	1	97
Minnesota	68	0	68	82	0	82
Missouri	194	21	215	385	100	485
Montana	61	0	61	61	0	61
Nevada	9	0	9	19	0	19
New Mexico	101	0	101	101	0	101
New York (Downstate), New Jersey	117	26	143	117	26	143
New York (Upstate)	158	12	170	166	12	178
Ohio	143	9	152	257	71	328
Pennsylvania	687	187	874	692	187	878
Tennessee	187	16	203	166	15	181
Texas	821	0	821	899	0	899
Utah	71	0	71	129	0	129
Virginia, District of Columbia	122	0	122	122	0	122
Washington, Oregon	72	0	72	51	0	51
West Virginia	282	79	360	305	96	402
Wisconsin	95	18	113	87	20	107
Wyoming	107	0	107	80	0	80
U.S. Total	6,158	621	6,779	6,754	796	7,550

SOURCE: Congressional Budget Office.

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applied to this coal, it would average $10.74 per ton in 1995 (compared with an Option V-1 rate of $5.17), which would cause 1995 production to drop from an expected level of 109.4 million tons to 92.2 million tons. Expected employment in 1995 would be lowered by 1,200 mining jobs. Despite this loss of projected 1995 production with Option V-2, Texas lignite production and employment would still more than double from current levels over the next 10 years.

TABLE 40. COAL PRODUCTION AS OF 1995 UNDER TWO SULFUR TAX OPTIONS COMPARED WITH TWO POLLUTER PAYS ROLLBACK PROGRAMS, BY STATE (In millions of tons)

State	Base Case	8 Million Ton Rollback Option II-1A	10 Million Ton Rollback Option II-2A	Sulfur Tax Options: Option V-1	Sulfur Tax Options: Option V-2
Alabama	23.8	25.5	22.1	25.5	27.9
Arizona	14.2	13.8	13.9	13.8	14.2
Colorado	19.1	20.3	23.5	20.4	21.3
Illinois	56.4	46.2	37.6	47.4	48.4
Indiana	29.2	24.3	19.7	24.3	24.5
Iowa	1.5	0.5	0.5	0.5	0.5
Kansas	2.5	0.4	0.4	0.4	3.7
Kentucky	208.9	211.6	195.9	196.3	210.1
Maryland	2.5	1.6	1.5	1.5	2.1
Missouri	8.1	5.4	5.3	5.4	7.8
Montana	34.0	26.0	26.0	33.7	30.9
New Mexico	31.9	31.8	31.9	31.9	31.2
North Dakota	22.7	22.7	22.7	22.7	22.7
Ohio	24.3	4.0	4.0	1.9	5.6
Oklahoma	7.7	7.0	7.0	7.5	8.3
Pennsylvania	82.3	69.4	56.3	68.9	69.7
Tennessee	5.3	6.9	4.9	6.9	6.9
Texas	109.4	108.8	108.8	110.6	92.2
Utah	31.6	31.8	32.8	32.5	33.3
Virginia	50.6	57.2	56.0	54.0	55.7
Washington	0.5	0.5	0.5	0.5	0.0
West Virginia	232.2	261.7	274.6	272.3	261.6
Wyoming	130.5	151.7	191.2	157.5	142.7
U.S. Total	1,128.9	1,129.1	1,137.1	1,136.4	1,121.3

SOURCE: Congressional Budget Office.

TABLE 41. COAL MINING EMPLOYMENT IN 1995 UNDER TWO SULFUR TAX POLICIES COMPARED WITH TWO POLLUTER PAYS ROLLBACK PROGRAMS, BY STATE (In number of job slots)

State	Base Case	8 Million Ton Rollback Option II-1A	10 Million Ton Rollback Option II-2A	Sulfur Tax Options: Option V-1	Sulfur Tax Options: Option V-2
Alabama	8,124	8,714	7,543	8,705	9,531
Arizona	1,177	1,141	1,155	1,141	1,177
Colorado	3,288	3,510	4,062	3,516	3,675
Illinois	14,733	12,068	9,823	12,392	12,658
Indiana	5,342	4,446	3,611	4,448	4,479
Iowa	344	110	110	111	111
Kansas	753	129	129	129	1,145
Kentucky	63,014	63,818	59,098	59,204	63,381
Maryland	695	447	417	425	597
Missouri	1,948	1,297	1,276	1,296	1,886
Montana	1,251	956	955	1,241	1,135
New Mexico	2,846	2,844	2,846	2,846	2,784
North Dakota	1,375	1,374	1,374	1,375	1,374
Ohio	7,136	1,183	1,183	556	1,653
Oklahoma	2,344	2,146	2,146	2,304	2,555
Pennsylvania	29,299	24,701	20,042	24,514	24,789
Tennessee	2,010	2,616	1,859	2,614	2,614
Texas	6,890	6,855	6,854	6,967	5,807
Utah	7,978	8,040	8,282	8,218	8,400
Virginia	19,339	21,852	21,375	20,625	21,263
Washington	48	48	48	48	0
West Virginia	89,473	100,811	105,792	104,899	100,773
Wyoming	5,768	6,706	8,451	6,964	6,309
U.S. Total	275,172	275,812	268,431	274,538	278,094

SOURCE: Congressional Budget Office.

CHAPTER VI

TWO RECENT CONGRESSIONAL PROPOSALS

Two proposals concerning acid rain have recently been introduced in the 99th Congress, both differing somewhat from the options described in the previous chapters. The most recent one (House bill H.R. 4567, introduced by Congressman Waxman) would require utilities to reduce SO_2 emissions by 9 million tons to 10 million tons from 1980 levels, depending on how the states respond to the requirements. The earlier and more stringent proposal (Senate bill S. 2203, introduced by Senator Stafford) would call for a SO_2 reduction of about 12 million tons from 1980 utility emissions. These bills also contain additional requirements that would lower SO_2 emissions from industrial facilities and nitrogen oxide emissions from utilities, industrial plants, and motor vehicles. Nevertheless, the sulfur dioxide control components remain the heart of each program, and would produce the greatest emission reductions and cost the most to achieve.

In this chapter, the sulfur dioxide provisions of each bill are examined as Options VI-1, VI-2, and VI-3. Option VI-1 is based on the House bill; it would lower utility SO_2 emissions by 9.1 million tons from 1980 levels, by requiring states to develop plans to limit utilities to a statewide average emission rate of 1.2 pounds of SO_2 per million British thermal units. Option VI-2 also is based on the House bill; it examines the effects of the so-called "default" provision that would be invoked if states did not establish control plans. This provision would require each affected power plant to meet an SO_2 emission limit of 1.2 pounds per million Btus, leading to a 9.9 million ton reduction from 1980 levels. Option VI-3 is based on the Senate bill, which, like the default portion of the House bill, would set a uniform emission rate for each affected power plant. The requirement under Option VI-3 would be far more stringent, however, stipulating that each plant limit SO_2 emissions to 0.7 pounds per million Btus burned, achieving an overall SO_2 reduction of 12.1 million tons from 1980 levels. None of the options provides a tax and subsidy scheme to encourage scrubbing; in this respect, they reflect the polluter pays principle. The House bill does have a potential subsidy mechanism to provide electricity rate relief if rate hikes exceed 10 percent as a result of the program, but this provision would not influence choice of control technology as the subsidy programs in earlier chapters would.

The discounted program cost of each bill differs greatly. Option VI-1 would cost about $26 billion (in discounted 1985 dollars) over the 1986-2015 period, while the default version, Option VI-2, would cost about $35 billion over the same period. Option VI-3, in contrast, would cost nearly $94 billion by 2015. These differences in costs remain substantial even when the level of emission reduction is taken into account using the cost-effectiveness measure. Option IV-1 would cost $299 per ton of SO_2 removed, with the figure rising to $368 per ton removed under Option VI-2. This value would more than double--to $779 per ton--under the provisions of Option VI-3. In comparison, the polluter pays, 10 million ton SO_2 reduction of Chapter II (Option II-2A) would cost $34.5 billion over the 1986-2015 period and roughly $360 per ton of SO_2 reduced. (All figures in discounted 1985 dollars.)

In terms of coal-market effects, the four most sensitive high-sulfur coal states--Illinois, Indiana, Ohio, and Pennsylvania--would face significant losses in expected 1995 mining jobs. Option VI-1 would reduce 1995 job slots in these states by 17,000 from the base case, and Option VI-2, by 18,100. Suprisingly, Option VI-3 would yield less of an employment loss in these states, as 1995 mining employment would be only 13,400 jobs lower than predicted under the base case. This slighter effect would occur because the strict emission limit prescribed under the Senate bill would make scrubbing the most economical, and often the only feasible, method to control emissions, thus discouraging switching to low-sulfur coal. The effects of these options may be compared with the 10 million ton SO_2 polluter pays reduction (Option II-2A), which would result in almost 21,900 lost job slots by 1995 in the four sensitive high-sulfur coal mining states.

METHODOLOGY USED TO EXAMINE THE TWO APPROACHES

The bills on which Options VI-1, VI-2, and VI-3 are based include more regulatory details than do any of the options so far considered in this report. For example, both bills would control pollution sources other than utilities and both would require reductions in nitrogen oxide emissions as well as SO_2 (see Table 42). In addition, neither bill calls for emission reductions to occur precisely by 1995. The House bill would have utilities reduce emissions in two phases, culminating in 1997. The Senate bill would require utilities eventually to retire individual boilers that could not meet the emission limit of 0.7 pounds SO_2 per million Btus; the retirement deadline would be within 10,000 hours of operation (roughly 2 years for most plants) after 1991. Finally, although neither bill contains a tax and subsidy program designed to encourage scrubbing, the House bill would partially subsidize utility costs if residential electricity rates rose by more than 10 percent above the expected rates. Such a subsidy would be funded by a temporary generation tax on fossil-fuel power plants of no more than 0.5 mills per kilowatt-hour (mills/kwh).

Despite the additional provisions included in each bill, the SO_2 reduction portions remain their most expensive element.[1] To estimate the cost of these recent proposals and allow comparison with previous options in this report, several simplifying assumptions were made for the analysis in this chapter. First, all emission reductions were assumed to take place by 1995, which is the compliance date for all options discussed in previous chapters. Second, all emission limits would be based on annual averages, typically the most lenient method allowed. Third, the statewide emission targets of Option VI-1, as well as the plant emission limits of Options VI-2 and VI-3, would apply only to plants built before the first New Source Performance Standard (NSPS) was put into effect. Fourth, Option VI-2, which depicts the default provision of the House bill, assumes that all states would be subject to the plant-by-plant limit, since it is impossible to predict which states would submit acceptable plans to achieve the statewide average limit of 1.2 pounds of SO_2 per million Btus. Finally, the cost and effect of emission control programs directed at sources other than utilities and at pollutants other than sulfur dioxide were not examined. These costs would be small in comparison with the sulfur dioxide control provisions, however. For a more detailed description of the methodology employed in this chapter, consult the appendix to this report.

SULFUR DIOXIDE REDUCTIONS AND COSTS

Compared with anticipated 1995 emission levels (the base case), Option VI-1 would reduce utility SO_2 levels by 8.3 million tons; Option VI-2, by 9.1 million tons; and Option VI-3, by almost 11.6 million tons (see Table 43). Using the familiar baseline of 1980, these options would produce a 9.1, 9.9, and 12.1 million ton SO_2 reduction, respectively, from 1980 levels of utility SO_2 emissions. For the states of Illinois, Indiana, Missouri, Ohio, Pennsylvania, and West Virginia, combined emissions in 1995 would have to be lowered by 60 percent under Option VI-1, 66 percent under Option VI-2, and by 77 percent under Option VI-3. In comparison, the polluter pays, 10 million ton reduction with fuel switching (Option II-2A) would reduce predicted 1995 emissions in this region by 65 percent.

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1. See, for example, Office of Technology Assessment, "Response to Questions About H.R. 4567 from Congressman John Dingell," May 9, 1986.

TABLE 42. COMPARISON OF TWO RECENT PROPOSALS WITH OPTIONS EXAMINED

Bill	Sulfur Dioxide Reduction Strategy	Nitrogen Dioxide Reduction Strategy	Tax and Subsidy Provisions
H.R. 4567	Utilities must meet a 10 million ton SO_2 reduction in two phases--by January 1, 1993, they meet a 2.0 pound SO_2 emission limit per million Btus; by January 1, 1997, they must meet a 1.2 pound SO_2 emission limit. [a] Industrial plants must meet a statewide average limit of 1.2 pounds SO_2 per million Btus by January 1, 1997.	Utility and industrial plants must meet a statewide nitrogen oxide emission limit of 0.6 pounds per million Btus by January 1, 1997. Tighter standards are also stipulated for new plants. Motor vehicles are subject to tighter emission standards to further reduce nitrogen oxide emissions.	Utilities whose residential customers experience a 10 percent or more rise in rates from the control program may receive a subsidy to lower price rises below 10 percent. This subsidy would be financed by a temporary fee no greater than 0.5 mills/kwh levied on fossil-fuel power plants. The subsidy would not influence abatement behavior.
S. 2203	After December 31, 1991, each fossil-fuel power plant is limited to 1 to 2 years of continued operation unless they meet an SO_2 limit of 0.7 pounds per million Btus. Meeting this requirement would produce about a 12 million ton reduction from 1980 SO_2 levels. Many older industrial plants would become subject to stricter, new source standards by 1992.	Utility and industrial plants must meet stricter standards by 1995. Levels for these limits are to be set by EPA based on current practices of OECD member countries. Motor vehicles also would be subject to tighter rules.	None.

(Continued)

TABLE 42. (Continued)

Option	Sulfur Dioxide Reduction Strategy	Nitrogen Dioxide Reduction Strategy	Tax and Subsidy Provisions
Option VI-1	Utilities must achieve a 9.1 million ton SO_2 reduction from 1980 levels by January 1, 1995. Reductions based on meeting statewide annual average limit of 1.2 pounds SO_2 per million Btus. No industrial emission reductions required.	None.	No tax and subsidy programs are assumed to influence compliance behavior. A 0.5 mill/kwh tax and subsidy program is discussed separately in text.
Option VI-2	Same as Option VI-1, except that each affected plant within the state must meet the 1.2 pound SO_2 per million Btus limit achieving a 9.4 million ton reduction.	None.	None.
Option VI-3	Utilities must meet a 12 million ton SO_2 reduction from 1980 levels by January 1, 1995. Reductions based on meeting an individual plant rate of 0.7 pounds SO_2 per million Btus. No industrial emission reductions required.	None.	None.

SOURCE: Congressional Budget Office.

a. To lower costs, states may submit plans to achieve the emission limits on a statewide average basis rather than on a per plant basis.

TABLE 43. EMISSIONS UNDER THREE OPTIONS BASED ON TWO CURRENT LEGISLATIVE PROPOSALS, COMPARED WITH A POLLUTER PAYS ROLLBACK OF 10 MILLION TONS, BY STATE (In thousands of tons of SO_2 emitted in 1995)

State	Base Case	10 Million Ton Rollback Option II-2A	Option VI-1	Option VI-2	Option VI-3	Difference from 10 Million Ton Rollback (Option II-2A) Option VI-1	Option VI-2	Option VI-3
Alabama, Mississippi	704	414	481	407	250	67	-7	-164
Arizona	122	106	113	122	84	8	17	-22
Arkansas, Oklahoma, Louisiana	336	302	290	312	309	-12	10	7
California	25	25	25	25	25	0	0	0
Carolinas, North and South	1,063	577	568	523	313	-9	-54	-263
Colorado	92	94	94	97	87	0	3	-7
Dakotas, North and South	105	105	106	96	87	1	-9	-18
Florida	772	566	672	553	474	106	-12	-92
Georgia	635	352	360	323	196	8	-29	-156
Idaho	0	0	0	0	0	0	0	0
Illinois	1,142	408	518	403	257	110	-5	-151
Indiana	1,433	553	607	557	368	54	4	-185
Iowa	326	167	181	203	141	14	36	-25
Kansas, Nebraska	174	163	174	166	151	11	3	-12
Kentucky	796	466	488	431	340	22	-35	-126
Maine, Vermont, New Hampshire	64	44	49	34	29	5	-10	-15
Maryland, Delaware	371	189	187	223	181	-2	34	-7
Massachusetts, Connecticut, Rhode Island	305	219	221	306	279	2	87	60

(Continued)

TABLE 43. (Continued)

State	Base Case	10 Million Ton Rollback Option II-2A	Option VI-1	Option VI-2	Option VI-3	Difference from 10 Million Ton Rollback (Option II-2A) Option VI-1	Option VI-2	Option VI-3
Michigan	598	374	402	335	205	28	-39	-169
Minnesota	230	146	168	146	117	22	1	-29
Missouri	1,257	293	341	255	230	47	-38	-63
Montana	71	68	71	71	68	3	3	0
Nevada	90	80	79	92	76	-1	12	-4
New Mexico	62	62	62	62	62	0	0	0
New York (Downstate), New Jersey	270	245	253	271	244	9	26	0
New York (Upstate)	343	141	305	170	147	165	30	6
Ohio	2,017	629	704	641	381	75	12	-248
Pennsylvania	1,439	578	715	566	371	136	-12	-207
Tennessee	761	281	303	276	152	22	-5	-129
Texas	586	567	565	555	476	-2	-12	-91
Utah	87	61	60	85	76	-1	23	15
Virginia, District of Columbia	213	175	172	187	151	-4	12	-24
Washington, Oregon	111	104	96	112	92	-8	8	-12
West Virginia	1,042	421	420	444	272	-1	23	-149
Wisconsin	746	199	221	223	152	22	24	-46
Wyoming	69	70	70	69	60	0	0	-9
U.S. Total	18,455	9,241	10,138	9,341	6,903	898	100	-2,337

SOURCE: Congressional Budget Office.

Virtually all the reductions obtained under Options VI-1 and VI-2 would occur as a result of utilities' switching to lower-sulfur coal. This is consistent with the findings of previous chapters; significant use of retrofit scrubbers would not occur at the 8 million ton to 10 million ton reduction level, unless fuel choice was restricted; scrubbers were mandated; or scrubbers were partially subsidized.[2] Significant scrubbing would occur under Option VI-3, however, even in the absence of such incentives. This option's strict emission limit essentially would force utilities to equip a substantial fraction of generating capacity with retrofit scrubbers because such technology represents the most economical and, in some cases, the only feasible method of attaining the required low emission rates.

Program Costs

Over the 1986-2015 period, Option VI-1 would cost roughly $25.9 billion, achieving a cost-effectiveness price of $299 per ton of SO_2 reduced (both in discounted 1985 dollars). If the default provision of Option VI-2 were invoked in every state, overall costs would rise to $34.9 billion, and $368 per ton of SO_2 reduced. In contrast, Option VI-3 would cost nearly $94 billion over the same period for a cost-effectiveness value of $779 per ton of SO_2 reduced (all in discounted 1985 dollars). Table 44 compares the total program costs and cost-effectiveness figures of both options with Option II-2A).

The figures shown in Table 44 highlight the trend found in previous chapters: as emission reductions increase beyond 8 million tons (based on the 1980 emission baseline) costs rapidly increase. For example, the cheapest option--polluter pays 8 million ton reduction (Option II-1A)--would achieve a cost-effectiveness of about $270 per ton of SO_2 reduced (in discounted 1985 dollars). Moving up to a 9.1 million ton reduction as formulated in Option VI-1, would cost $299 per ton of SO_2 reduced, only a slight increase over Option II-1A. To achieve a 10 million ton reduction, however, would cost at least $360 dollars per ton of SO_2 reduced (Option II-2A), indicating a steeper rise in the cost-of-control curve. Option VI-2 would cost slightly more, at $368 per ton, because of the lack of choice implied by a plant-by-plant emission rate compared with statewide averages that achieve roughly the same total emissions. Finally, a 12.1 million ton reduction, as expressed in Option VI-3, would cost $779 per ton of SO_2 reduced, well over twice as much as Option VI-1 while achieving only about one-quarter more emission reductions.

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2. All options are described in the glossary at the end of this report.

TABLE 44. TOTAL PROGRAM COSTS AND COST-EFFECTIVENESS OF THREE OPTIONS BASED ON TWO CURRENT LEGISLATIVE PROPOSALS, COMPARED WITH A POLLUTER PAYS ROLLBACK OF 10 MILLION TONS

	10 Million Ton Rollback Option II-2A	Option VI-1	Option VI-2	Option VI-3
Total Program Cost (In billions of discounted 1985 dollars) a/	34.5	25.9	34.9	93.6
Cost-Effectiveness (In 1985 dollars per ton SO_2 reduced) b/	360	299	368	779

SOURCE: Congressional Budget Office.

a. Reflects net present value of sum of program costs incurred from 1986 through 2015, discounted to 1985 dollars. These costs consist of real annual utility expenditures in excess of current policy, which is equivalent to net utility cost, plus subsidies, minus taxes paid. A real discount rate of 3.7 percent was used in the calculations.

b. Represents the discounted program costs, divided by the annual discounted SO_2 reduction from current policy measured over the 1986-2015 period.

The higher costs associated with larger emission reductions can also be described as the cost attributable to abating an incremental ton of SO_2, often called the marginal cost of abatement. For example, the average cost of achieving an additional 2 million ton reduction by moving from 8 million tons to 10 million tons would cost about $720 per ton of SO_2 removed. Similarly, the marginal cost of abating an additional 2.1 million tons by increasing the rollback from 10 million tons to 12.1 million tons is about $2,775 per ton. These figures illustrate that additional reductions would become very expensive at the rollback levels currently being considered. 3/

3. These values are calculated by multiplying the cost-effectiveness figures by their respective reduction from 1980 levels and dividing the resulting differences by the appropriate increment in emission reduction. This is meant only to illustrate the possible magnitude of marginal cost, and would likely understate the true cost of increasing abatement beyond some reference level. Moreover, marginal cost varies considerably by region under allocation schemes that impose reduction targets.

Finally, the costs shown in Table 44 may overestimate the expense of Option VI-3, a policy that relies heavily on accelerated retirement of older, polluting plants as part of its abatement strategy. In this analysis, the total cost of Option VI-3 includes the expense of building new generation facilities to replace those that must be retired in order to comply with the emission reduction targets. But not all of this cost can be correctly assigned to Option VI-3, since many of the plants in question would have to be replaced eventually because of their age. Thus, Option VI-3 would accelerate the pace of replacing older power plants, and only the cost of this accelerated investment should be attributed to the acid rain policy, not the total cost of all the new power plants. To some extent, this problem pertains to all SO_2 control proposals, since plant retirement is always an option available to the utility. The effect is likely more pronounced in Option VI-3, however, which relies on replacement of older, less controlled power plants.

Effect On Utility Costs

Since both the House and Senate proposals embody the polluter pays principle, all direct abatement costs would be reflected in an increase in the annual cost to utilities of generating electricity. A possible exception would occur in the event that the emission control costs under the House bill (Option VI-1) would cause residential electricity rates to increase by 10 percent or more, which would trigger the rate subsidy provision. In most cases, increases of this magnitude probably would not occur.

Table 45 shows the 1995 annual generating cost of the options based on the two bills. Compared with the base case, the total annual utility cost of Option VI-1 would be $2.5 billion more in 1995; under the default provision of Option VI-2, costs would rise by $3.3 billion. In contrast, Option VI-3 would cost $8.8 billion more annually than the base case; this would represent the highest annual costs incurred under any option considered in this report. As expected, most of the expense would be concentrated in the midwestern and Appalachian states, where the costs of Option VI-3 would typically be two to three times higher than Options VI-1 or VI-2.

Comparing these annual costs with Option II-2A (as shown in Table 45), Option VI-1 would cost utilities $761 million less nationwide each year, while Option VI-2 would cost about the same as Option II-2A. The most stringent plan, Option VI-3, would cost nearly $5.6 billion more per year.

Within states, utility costs do not necessarily rise evenly when the level of control is increased. As discussed in earlier chapters, several fac-